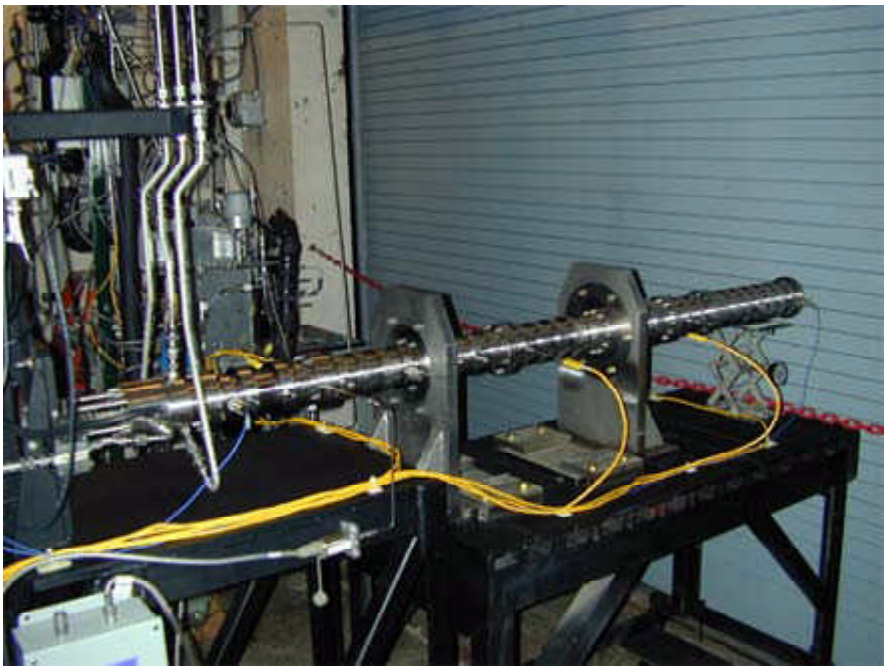
Pulse Detonation Engine Test Bed Developed

A detonation is a supersonic combustion wave. A Pulse Detonation Engine (PDE) repetitively creates a series of detonation waves to take advantage of rapid burning and high peak pressures to efficiently produce thrust. NASA Glenn Research Center's Combustion Branch has developed a PDE test bed that can reproduce the operating conditions that might be encountered in an actual engine. It allows the rapid and cost-efficient evaluation of the technical issues and technologies associated with these engines.

The test bed is modular in design. It consists of various length sections of both 2- and 2.6-in. internal-diameter combustor tubes. These tubes can be bolted together to create a variety of combustor configurations. A series of bosses allow instrumentation to be inserted on the tubes. Dynamic pressure sensors and heat flux gauges have been used to characterize the performance of the test bed. The PDE test bed is designed to utilize an existing calorimeter (for heat load measurement) and windowed (for optical access) combustor sections. It uses hydrogen as the fuel, and oxygen and nitrogen are mixed to simulate air. An electronic controller is used to open the hydrogen and air valves (or a continuous flow of air is used) and to fire the spark at the appropriate times.

Scheduled tests on the test bed include an evaluation of the pumping ability of the train of detonation waves for use in an ejector and an evaluation of the pollutants formed in a PDE combustor. Glenn's Combustion Branch uses the National Combustor Code (NCC) to perform numerical analyses of PDE's as well as to evaluate alternative detonative combustion devices.



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